A Fly's Eye Telescope to Mars.

The Remarkable Instrument Which Will Bring the Planet Into Plain Sight, with 91 Separate Lenses, Each Helping to Annihilate Space Through Millions of Miles of Sky

"BEFORE the year 1900 we will see the men and women on the planet Mars. Within three years we will be able to study at close range the people of another world."

This astounding statement was made last week to a Journal reporter by Professor T. S. C. Lowe, the eminent scientist of Mount Lowe Observatory, Mount Lowe, California. But Professor Lowe does not only make the statement. He is now in the East arranging with a syndicate of capitalists to have his statement absolutely and practically realized. He will have erected on one of the highest summits of the Sierra Madre mountains in Southern California, near Pasadena, an immense telescope with an objective so great, and a magnifying power so tremendous, that if the hopes of its inventor are realized it will revolutionize astronomical science. It will penetrate into other worlds, lay open the secrets of the stars, and if, as many scientists believe, there are people on the planet Mars, it will enable us to observe and study them.

If New York City were on the moon, and an observer were to look at it through the Yerkes telescope, with a magnifying power of 4,000 diameters, the city would present the same appearance as if looked at through the naked eye from a distance of sixty miles. Looked at under the same conditions through the Gathmann telescope, with a magnifying power of 8,000 diameters, the city would appear to the observer as if he were looking at it with the naked eye from a distance of thirty miles.

As an illustration, if the accompanying cut of New York City be held twenty-three inches from the eye, it will look as big as the city would look if it were on the moon and viewed through the Gathmann telescope.

The new telescope is the invention of Louis Gathmann, a Chicago inventor, and its construction will mark an entirely new departure in the manufacture of great telescopes. Its lens will be 72 inches in diameter, almost twice as great as that of the big Yerkes telescope at Lake Geneva, Wis. But the new instrument will be built on radically different lines from those of the Yerkes glass or any of the other great glasses in existence.

The telescopes now used in the various observatories are all built on the same plan. They are all achromatic refractors, consisting of but one lens. This lens is made from two discs of glass, one of which is crown and the other flint glass. The two neutralize the colored rays so that only a white light comes to the eyes of the observer.

The Yerkes lens, forty inches in diameter, is the largest single lens in the world. There seems to be little doubt that in this lens the limit of size for single refractors has been reached. Professor Clark, who made the Yerkes glass, maintains that he can grind a perfect lens forty-five inches in diameter. But so many difficulties, resulting from the necessary weight and flexibility of the glass present themselves that the best scientific opinion regards a forty-five-inch single glass as impracticable.

The new telescope, instead of one single lens, will have a lens made up of many lenses. Each lens will be six inches in diameter. There will be one centre lens. Around that there will be a ring of six more lenses, then another circle of twelve lenses, then eighteen, then twenty-four, and so on up to the outer circle, which will consist of thirty lenses. In all ninety-one individual six-inch lenses will compose the 72-inch lens of the new telescope. All these homogeneous lenses will be cemented in a sash or frame. The cement will have the same co-efficient of expansion and contraction as the glass of the lenses. When the glasses are firmly set the whole will be taken and ground, just as if it were a single piece of glass, thus bringing the rays of light from every piece of glass to the one focal point. In all temperatures the expansion and contraction of the glass and cement will be exact and the cluster of lenses will be in perfect focus at all times.

That this can be done successfully, and without the chromatism that might be anticipated as a hindrance to astronomical observation, is no longer a question. Demonstration by Mr. Gathmann has already silenced criticism forever on that point. For more than a year he has had in practical operation in his observatory at Chicago a telescope built upon the sectional lens plan. Its objective is made up of thirteen small lenses, and is but seven inches in diameter, but the results obtained by it have been remarkable.

From a scientific standpoint, there seems to be no reason to doubt the practicability of the inventor's principle. It is as perfectly in accord with the laws of optics to bring to a common focus the rays of light through a dozen different lenses, even though they be of diverse shapes and sizes, as it is to bring all the rays of light to a common focus that pass through or are refracted through a single lens of large or small size.

Any microscopic student of the eye of a fly knows that it is composed, practically, of 2,000 separate lenses, but all working in perfect harmony to produce clearest sight for the insect. So the Gathmann telescope, composed of any number of lenses, all refracting to a given focus, simply patterns after that which nature has been always doing and making no fuss about.

The tube of the new telescope will be much shorter than the tubes of the single lens glasses. Ordinarily the larger the lens the longer and heavier is the tube, and it therefore necessarily requires more expensive and complicated machinery to handle it. But in the Gathmann glass the focal length of the telescope will be made to correspond to the size and curves of the surface of the lens employed. This, of course, will result in a comparatively short tube, less machinery to operate, and, therefore, a smaller dome for the observatory.

In construction these are the essential points of difference between the Gathmann telescope and the other great glasses now in use. But the effect of the new glass in the astronomical world promises to be revolutionizing.

The majority of astronomers contend that the greatest foe to the large telescope is the atmosphere itself. They declare that as a result of the almost constantly disturbed condition of the air, the image of a celestial body, when looked at through a large telescope, is usually blurred or totally destroyed. Notwithstanding that they select the most favorable locations and climates for their researches, they declare that a perfect observation with the large telescope is a comparatively rare occurrence. 'This they attribute to the atmosphere.

Mr. Gathmann does not agree with these scientists. He maintains that the so-called disturbed condition of the atmosphere does not exist, and declares that the seeming disturbance is wholly a defect in the construction of the present large telescopes. He points out that the tremulous condition of the atmosphere is readily noticeable in the large glasses, but is not perceptible in the smaller glasses. This fact all astronomers admit.

In the large telescopes now in use the two large glasses, which compose the single lens are ground and corrected in a room of even temperature. One of these glasses is of flint and extremely hard, the other is of crown and comparatively soft. As these glasses are corrected with great care at a certain temperature, the moment they are opened up for observation in a different temperature an adjustment to that temperature in the two glasses immediately takes place. This is in accordance with the well-known law of expansion and contraction. In the softer piece of glass the adjustment is quicker and greater than in the harder, and by this uneven molecular action in each piece is that quivering appearance produced which astronomers refer to as "the tremulous condition of the atmosphere." In the larger glasses this condition is easily perceptible, but in an eight or a six inch glass is scarcely noticeable.

All astronomers are agreed that for practical working purposes, the smaller glasses usually give the best satisfaction. But all, too, are unanimous in declaring that if they could take perfect observations with a large and powerful glass the advantages to science would be tremendous. Right here Mr. Gathmann steps in and asserts that his invention has all the advantages of the perfect small lens, with the immense magnifying power which a seventy-two-inch objective makes possible.

It is this great increase of magnifying power in the new telescope which will work new wonders in astronomical science. To secure this the first essential is the supply of light. This the Gathmann telescope will secure to a much greater degree than any other, because its objective by which the light is admitted will be twice as great as any other in existence.

Another and equally important feature of the Gathmann lens is the certainty of securing a perfect lens. The larger the glass the more likely is it to meet with accidents and to contain numerous imperfections. Every large lens in existence is more or less full of flaws. It would be extremely difficult to find one so perfect that it could be cut up and all of its fractions used for microscope lenses. But, on the contrary, every one qualified to judge knows that it is easy to make a small glass and make it absolutely without flaw. As the sectional lens is made up of many small glasses, each one perfect in itself, one can rely absolutely on securing a perfect large lens.

It is this combination of these two long sought for qualities in the Gathmann telescope which leads the scientific world to hope for most important discoveries with the new instrument.

"There is no reason in telescopic science," says Mr. Gathman, "why we should not see the inhabitants of Mars and see, too, well enough to pick up a pin on the moon." But the Gathmann telescope has another most important and practical advantage, the question of cost. The lens is the great item in the cost of producing a telescope. When the size of the glass goes above thirty inches a sectional lens can be produced for one-tenth the expense of an entire lens. As the size increases the proportion of difference in cost grows in favor of the sectional lens. This is a most important difference in the production of a great glass."

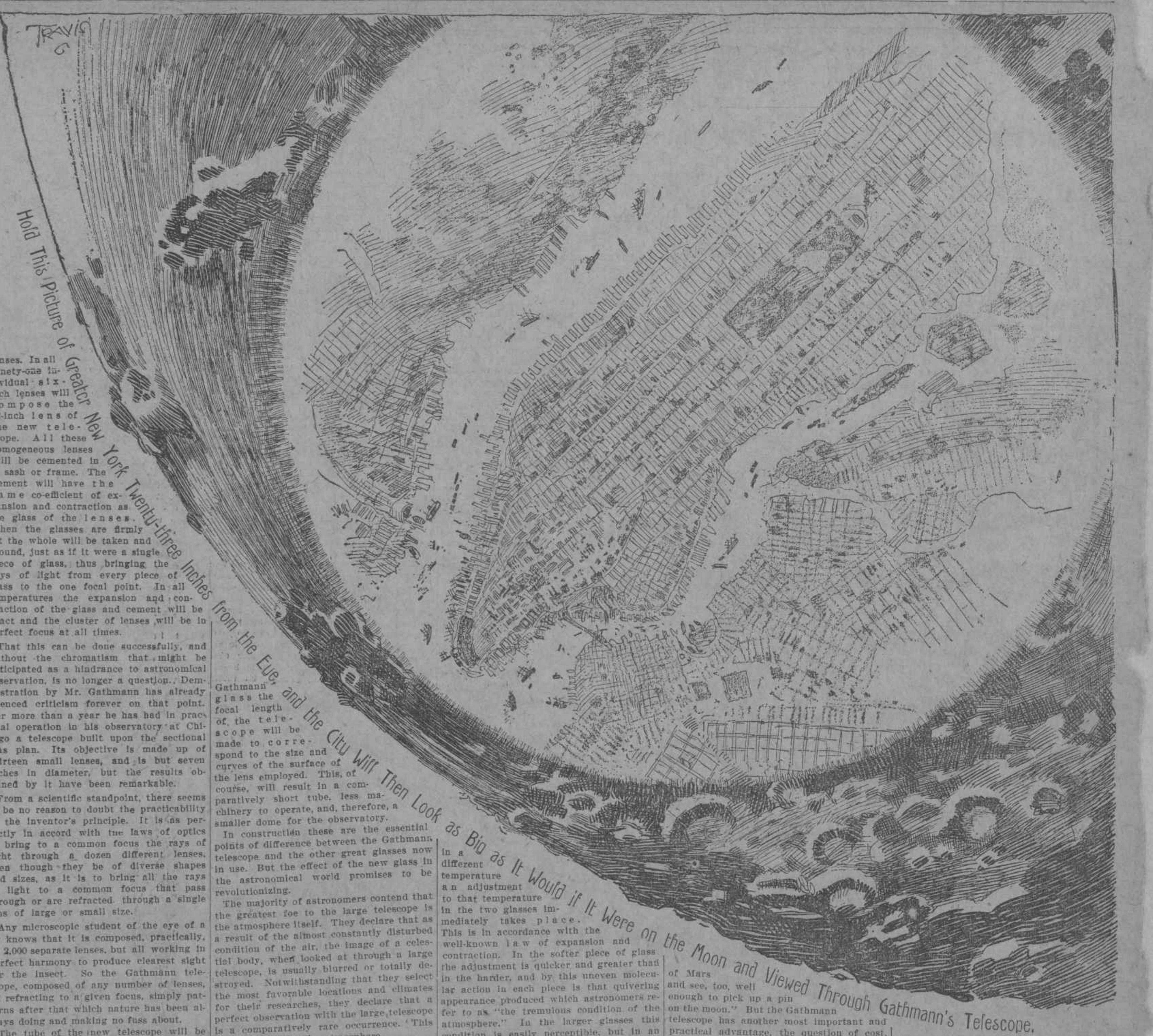
No doubt when the Gathmann telescope is erected the first object on which it will be turned is the planet Mars. Scientists know that from its geographical and meteorological conditions there is no reason why the highest type of organic life should not exist on that planet. They know that it has mountains and seas and fields and immense canals and an unwonted activity at times, leading many to suppose that Mars is inhabited and that for years its people have been signalling to the earth. With the new telescope we may soon get definite knowledge on the subject.

The present Mount Lowe Observatory is located on a slope above Echo Mountain, one of the spurs of the Sierra Madre Mountains, in Southern California. It is 3,500 feet above the level of the sea, and is reached by the Mount Lowe electric railway. But for the new telescope another observatory will be built on the highest crest of the Sierra Madre—6,000 feet above the level of the sea, which is 2,000 feet higher than the Lick Observatory, on Mount Hamilton. The climate of Mount Lowe is specially well adapted to astronomical pursuits. The temperature is relatively constant, and the air is remarkably clear and free from heat tremors.

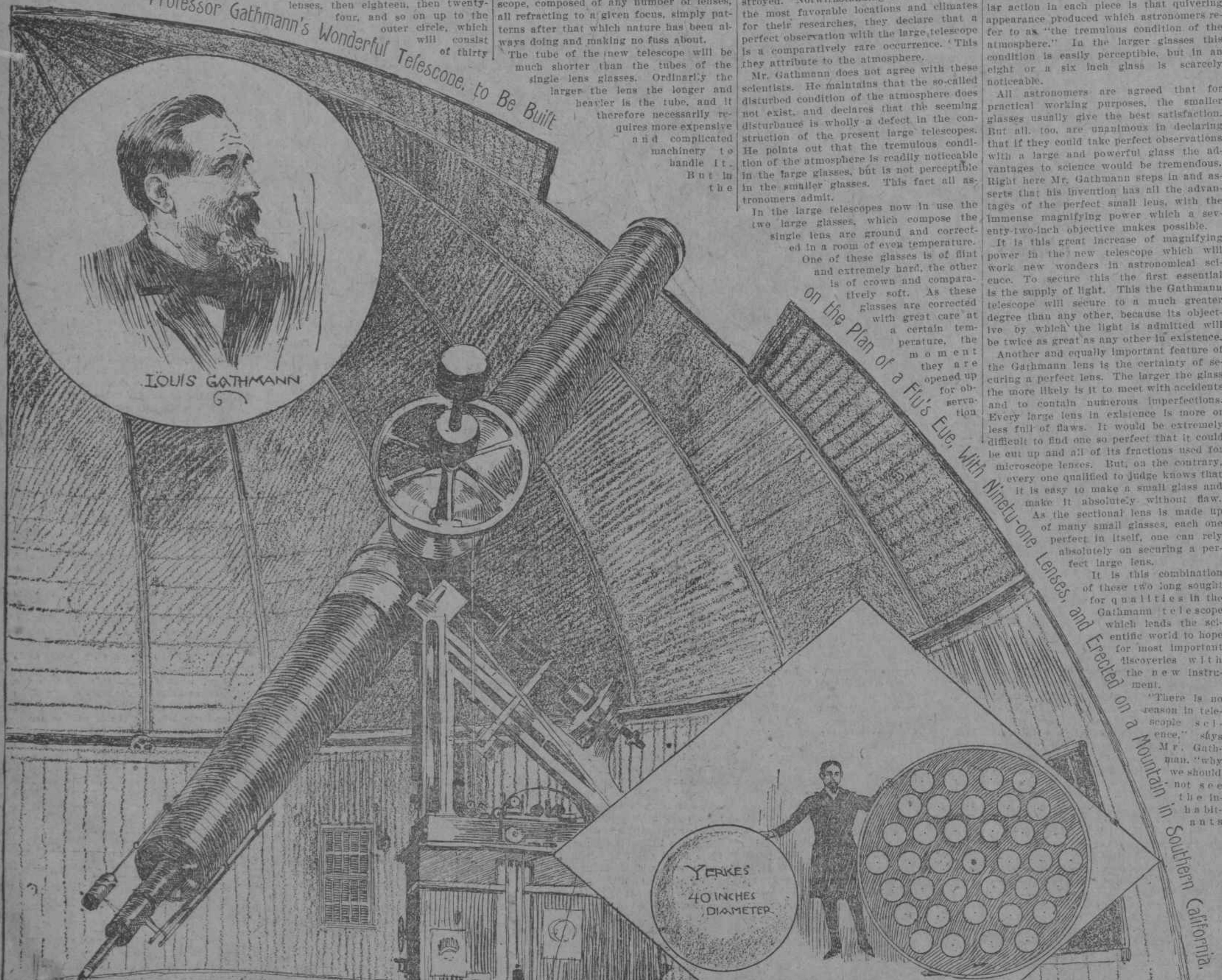
Professor Lowe, who will erect the Gathmann telescope, is the foremost figure in Southern California. He has the genius, enterprise and means to carry out his undertaking successfully. He, too, is an inventor of note. It was he who invented the process of making water gas for illuminating purposes; he also invented the method for the artificial manufacture of ice. During the Civil War he originated a practical system of balloon observations for war purposes.

Perhaps his crowning achievement, however, has been his engineering feat by which he built an electric railway up 6,000 feet of mountain side to the highest crest of the Sierra Madre. He is, however, a man of untiring energy, and he has thrown himself into the work of erecting the greatest telescope in the world with his usual push and enterprise. It seems fitting that it should be located on the mountain which bears his name.

Dr. Lewis Swift, formerly of the Warner Observatory, of Rochester, N. Y.—the "indefatigable comet seeker," as his brother-astronomers call him—is at present in charge of Mount Lowe Observatory. He wears the medals of the French Academy and also of the Royal Academy of Great Britain for his important astronomical discoveries. He will be in charge of the new telescope, and naturally looks forward with the keenest anticipation to its completion and first trial.



Hold This Picture of Greater New York Twenty-three Inches from the Eye, and the City Will Then Look as Big as It Would if It Were on the Moon and Viewed Through Gathmann's Telescope.



Professor Gathmann's Wonderful Telescope, to Be Built on the Plan of a Fly's Eye, With Ninety-one Lenses, and Erected on a Mountain in Southern California.

Phew! To Europe in Sixteen Hours!

Engineer Voss, of the shipbuilding firm of Blohm & Voss, in Hamburg, Germany, has completed plans for a giant ocean greyhound that is intended to cross from Southampton to New York in sixteen hours, just time enough for a man to recover from his farewell dinner. An ocean trip of sixteen hours between these points means a speed of one hundred and ninety miles per hour.

The other day Herr Voss submitted a model of the projected steamer, together with plans and description, to a meeting of the Hamburg Society of Seamen and Shipowners.

The inventor bases his calculations on a multiplicity of screws. The greatest number of screws now employed in ship building is three. Voss means to use ten screws, and whereas the existing three-screw steamers, notably the United States cruiser Columbia and the German man-of-war Kaiserin Augusta, carry their propellers aft, set in the form of a triangle with the middle screw a little lower than the others, the Hamburg inventor proposes to furnish both sides of his ship with five screws each, distributed at regular intervals from bow to stern. By this means he hopes to give the ship the greatest possible amount of stability and to prevent her from rolling. His plan presupposes that the screws will remain steadily in the water and be enabled to do their work uninterruptedly.

Another important feature of the construction of the ten-screw steamer is the contemplated removal of water friction, which, according to Herr Voss, will likewise be accomplished by the novel distribution of screws.

The four forward screws, two on each side, counting from the bow, are to thrust the vessel forward by the following methods: One blade is to push the water under the ship, while the other throws the water off or drives it away. The two screws under the centre of the vessel and the four screws aft at the same time pull and push forward with irresistible force.

The inventor further claims that his ten-screw boat will go just as fast in heavy as it will in calm weather. He is therefore confident that the journey from Southampton to New York can be made in sixteen hours during all seasons of the year.

New York ship builders and engineers to whom the above information was submitted, said Herr Voss's plans were quite feasible, though they doubted that any person of the present generation would ever cross the ocean in sixteen hours except by a flying machine or by means of a pneumatic tube.

Chief Engineer Carnegie, of the American Line, said there could be no trouble in working ten screws simultaneously, looking at it from a mechanical standpoint, but he was afraid that a ship so constructed would have to carry so much machinery that there would be little room left for anything or anybody else. However, he thought the matter worthy of the attention of ship builders and said his line would watch the experiment with interest. As to the prevention of rolling, he thought that Mr Voss's calculations were about correct